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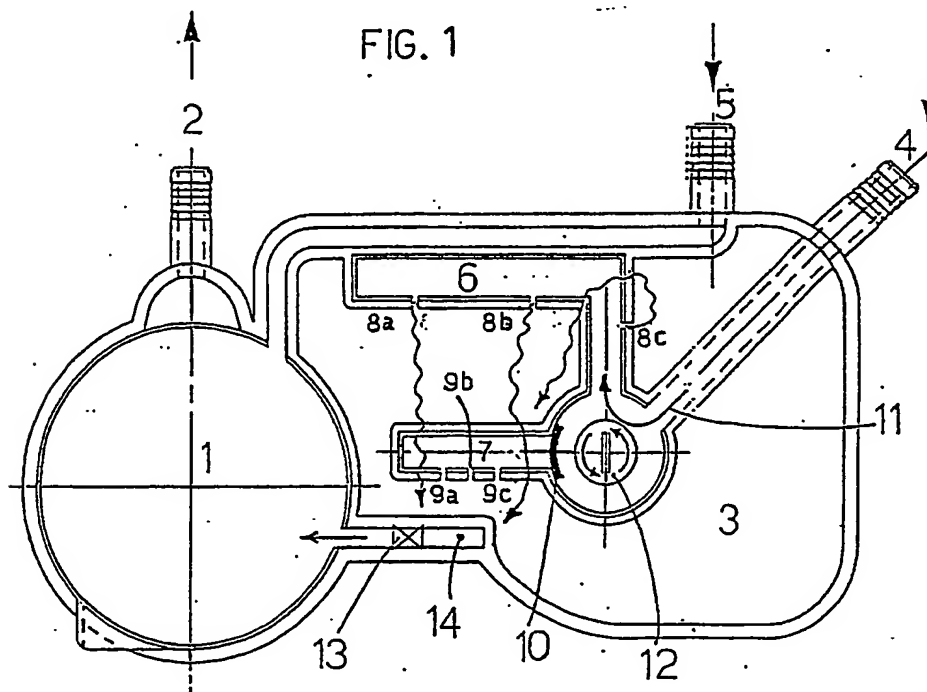
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⑤4 Improvements to the water softening system in a washing machine.

⑤7 It is described an improved water softening system in a washing machine, particularly a dishwasher for domestic use, comprising a vessel (1) for ions exchange resins which have to be periodically regenerated, by passing a sodium chloride solution

through them; the main feature of the described system is that there are provided means for varying the sodium chloride concentration of a fixed volume of water, to be used for the regeneration, by changing the path of the water inside the salt vessel (3).



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## IMPROVEMENTS TO THE WATER SOFTENING SYSTEM IN A WASHING MACHINE

The present invention refers to an improved water softening system in a washing machine, particularly a dishwasher for domestic use, comprising a vessel of ions exchange resins which have to be periodically regenerated, by passing a sodium chloride solution through them.

Softening systems of the indicated type are known; in fact they are used in almost all the dishwashers for domestic use.

In these systems water for the washing supplied from the mains is passed through a resins vessel, in order to minimize percentage of calcium, which could hinder the activity of the detergents and leave dull deposits at the end of washing.

As the resins became exhaust after a certain volume of water softened, they have to be regenerated, by passing a sodium chloride solution through them; in this way the resins calcium ions are replaced by the sodium ions and the resins are so ready for a new water softening phase.

The water and salt (brine) volume which passes in contact with the resins is equivalent to the volume of water which, generally for gravity, is conveyed in the salt vessel, by a command of the timer to an electric valve arranged in the circuit; it is usually provided the possibility to regulate the resin decalcification in function of the hardness of the mains water, by acting on a fixed regulation which causes a volume variation of the water which falls and, consequently, a bigger or smaller inflow of brine in the resins (decalcification with variable regeneration volume).

This system has the drawback that the resins are not always wetted by the same volume of brine, so that not always all the resins are treated by the brine, and the optimal resins regeneration is not reached.

Object of the present invention to indicate a softening system wherein the resins regeneration regulation does not present the cited drawback of the known systems, and which is simple to be carried out by the user.

To obtain said object, the subject of the present invention is an improved water softening system in a washing machine, particularly a dishwasher for domestic use, comprising a vessel for ions exchange resins which have to be periodically regenerated, by passing a sodium chloride solution through them, characterized in that there are provided means for varying the sodium chloride concentration of a fixed volume of water, to be used for the regeneration, by changing the path of the water inside the salt vessel.

Further objects and advantages of the present invention will be clear from the detailed description

which follows and from the attached drawings, which are supplied only as an explanatory and not limiting example, wherein:

figure 1 shows schematically an horizontal cross-section of the container where the brine is prepared in a system according to the invention, in a first operating condition;

figure 2 shows schematically an horizontal cross-section of the same container of figure 1, in a second operating condition;

figure 3 shows schematically in vertical cross-section of the same container of figure 1.

With reference to figure 1, where there is schematically shown an horizontal cross-section of the container wherein the brine is prepared in a system according to the invention, in a first operating condition, reference number 1 indicates the resins vessel; reference number 2 indicates the pipe connector through which the water exits from the vessel 1; reference number 3 indicates the salt (sodium chloride) vessel for the brine preparation; reference number 4 indicates the pipe connector through which the regeneration water is let in the vessel 3; reference number 5 indicates the inlet connector of the water from the mains, to be softened, which is let in the vessel 1.

With reference numbers 6 and 7 there are indicated two alternative exits for the regeneration water coming from pipe 4; channel 6 has several exit holes 8a, 8b, 8c; channel 7 has other exit holes 9a, 9b, 9c.

A deviation device 10, commanded by a rotating device 12, provides for deviating the regeneration water towards channel 6 (see direction-arrow 11 of fig. 1); in this way the water exits in the vessel 3 through the range of holes 8. The brine then arrives to the resins vessel 1, through the channel 14 when the electric valve 13 is open. As the holes 8 are relatively away from the inlet of channel 14, the regeneration water follows a quite long path through the brine, before arriving to the channel 14; the brine which passes in the resins vessel is consequently quite concentrated, and therefore able to perform a regeneration in the case of resins which have treated water which was very hard.

In figure 2, where there is schematically shown an horizontal cross-section of the same container of figure 1, in a second operating condition, there are represented the same elements, indicated with the same reference numbers.

The device 12, however, has been rotated of 90°, so that the deviation device 10 now provides for deviating the regeneration water towards channel 7; the water consequently exits through the

range of holes 9, which are relatively close to the inlet of channel 14, and follows a quite short path through the brine, before arriving to the channel 14; the resulting brine is consequently not very concentrated, and therefore able to perform a regeneration in case of resins which have treated water whose hardness level was not very high.

In figure 3 there is schematically shown a vertical cross-section of the same container of figure 1; reference numbers 3, 4 and 12 indicates the same elements described with reference to figure 1. With reference number 15 there is indicated a plastic spoon, furnished with the machine for detergent dosage purposes, which can be advantageously used also for executing the rotation of the command device 12, in order to choose the most suitable position in function of the hardness of the available water.

In fact the handle of the spoon 15 is realized so that it can be inserted in an appropriate notch obtained in the rod of the command device 12.

The characteristics of the described softening system are clear from the given description and the annexed drawings. From the description the advantages of the softening system object of the present invention are also clear.

Particularly, they are represented by the fact that:

- using an always constant volume of water, equivalent to the optimum one, it is obtained a full wetting of the resins in every regulating condition;
- the path followed by the regeneration water in the salt always occurs in the lower zone of the vessel 3, so to exploit the greater possible concentration of the brine, which is always arranged in a stratified manner with maximum density in the lower zone; furthermore, the result is constant, whichever is the quantity of salt remained in the vessel, because the drawing is always done from the lower zone;
- the regulation can be done very easily by the user, every time that there is this necessity.

It is clear that many variations to the softening system, described as an example, are possible for the man skilled in the art, without departing from the novelty principles inherent to the invention. For instance it is possible to foresee more than two regulating positions, providing three or more exit channels for the regeneration water in the vessel 3, arranged at different distances from the inlet of the channel 14; providing a regulating system with three or more positions it is also easily possible to obtain a regulation of gradual type, for example by selecting (in the case of three paths) firstly only the shorter path, then only the medium one, then the short and the medium ones together, then only the longer one, then the medium and the longer ones together.

## Claims

1. Improved water softening system in a washing machine, particularly a dishwasher for domestic use, comprising a vessel for ions exchange resins (1) which have to be periodically regenerated, by passing a sodium chloride solution through them, characterized in that there are provided means (6,7,10,12) for varying the sodium chloride concentration of a fixed volume of water, to be used for the regeneration, by changing the path of the water inside the salt vessel (3).
2. Water softening system in a washing machine, according to claim 1, characterized in that said means for varying the sodium chloride concentration in the water to be used for the regeneration comprise a deviation device (10).
3. Water softening system in a washing machine, according to claim 2, characterized in that said deviation device is a rotating deviation device (10).
4. Water softening system in a washing machine, according to claim 2, characterized in that said deviation device (10) provides for deviating the water either towards a first longer path (6,8) inside the salt vessel (3) or towards a second shorter path (7,9) inside the same vessel.
5. Water softening system in a washing machine, according to claim 2, characterized in that said deviation device (10) is easily commanded by means of a command device (12) accessible to the user.
6. Water softening system in a washing machine, according to claim 1, characterized in that said means (6,7,10,12) for varying the sodium chloride concentration of a fixed volume of water, to be used for the regeneration, by changing the path of the water inside the salt container (3), provide for the realization of more than two different paths.
7. Water softening system in a washing machine, according to claim 5, characterized in that said command device (12) may be operated by means of a tool (15) supplied with the machine.
8. Water softening system in a washing machine, according to claim 4 characterized in that said two paths, the longer one (6,8) and the shorter one (7,9) are both in the lower zone of said vessel (3).
9. Water softening system in a washing machine, according to claim 6, characterized in that said more than two different paths are in the lower zone of said vessel (3).

FIG. 1

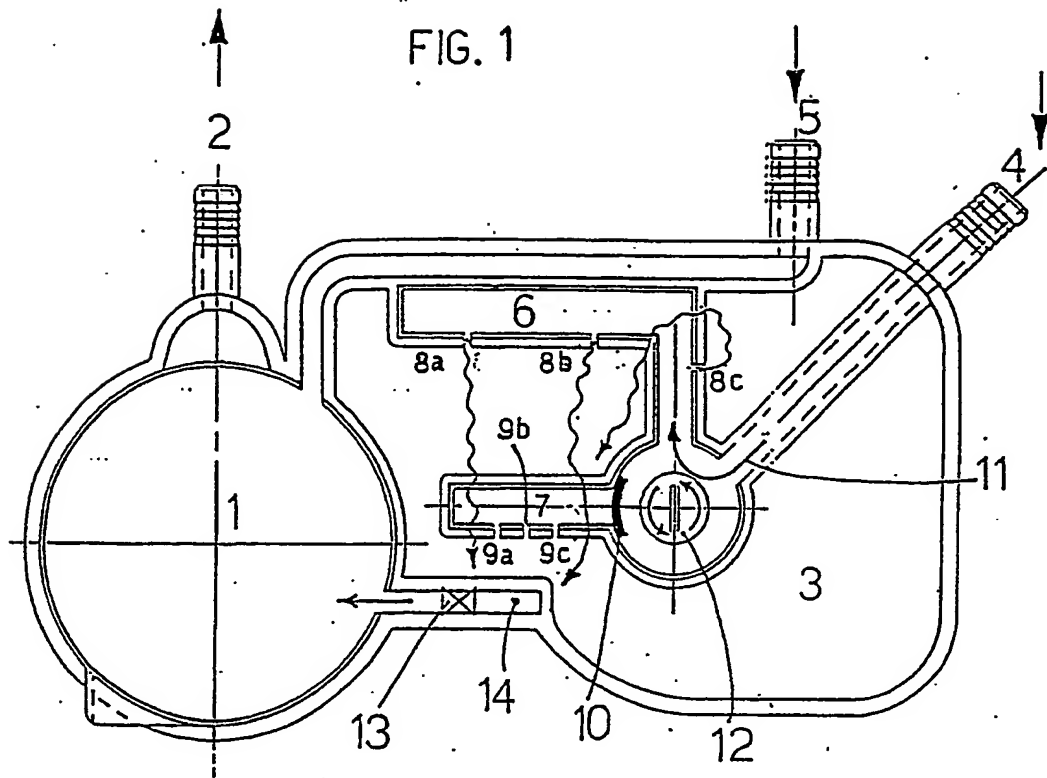


FIG. 2

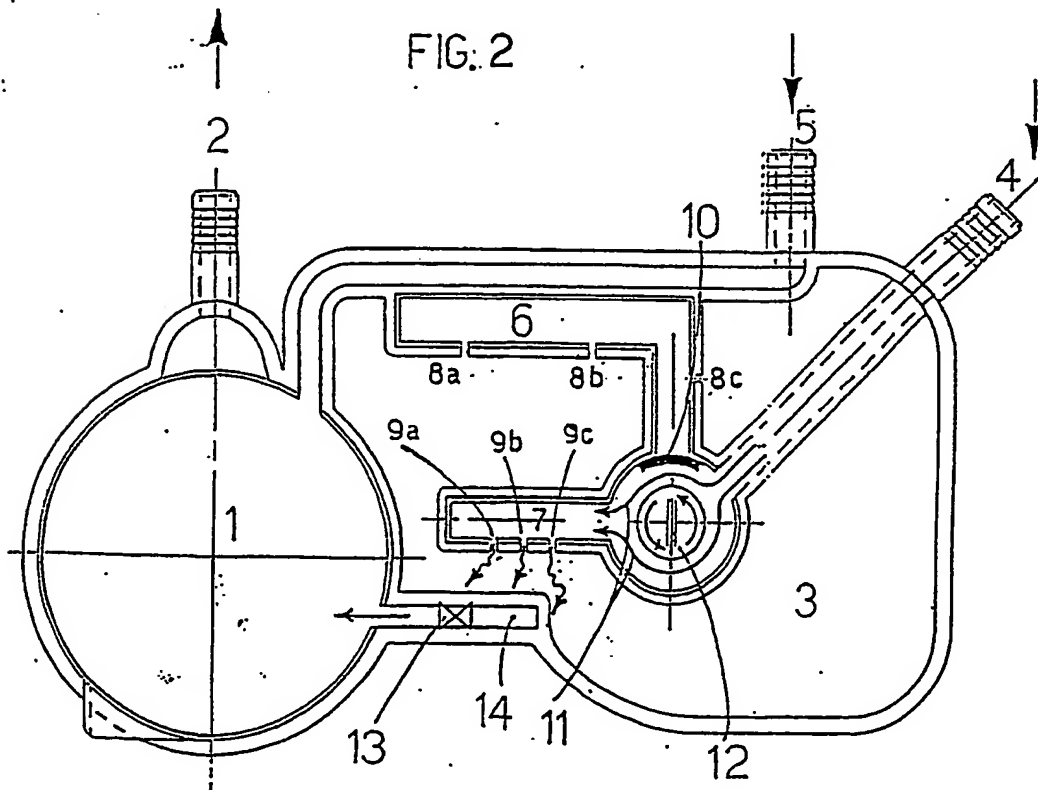
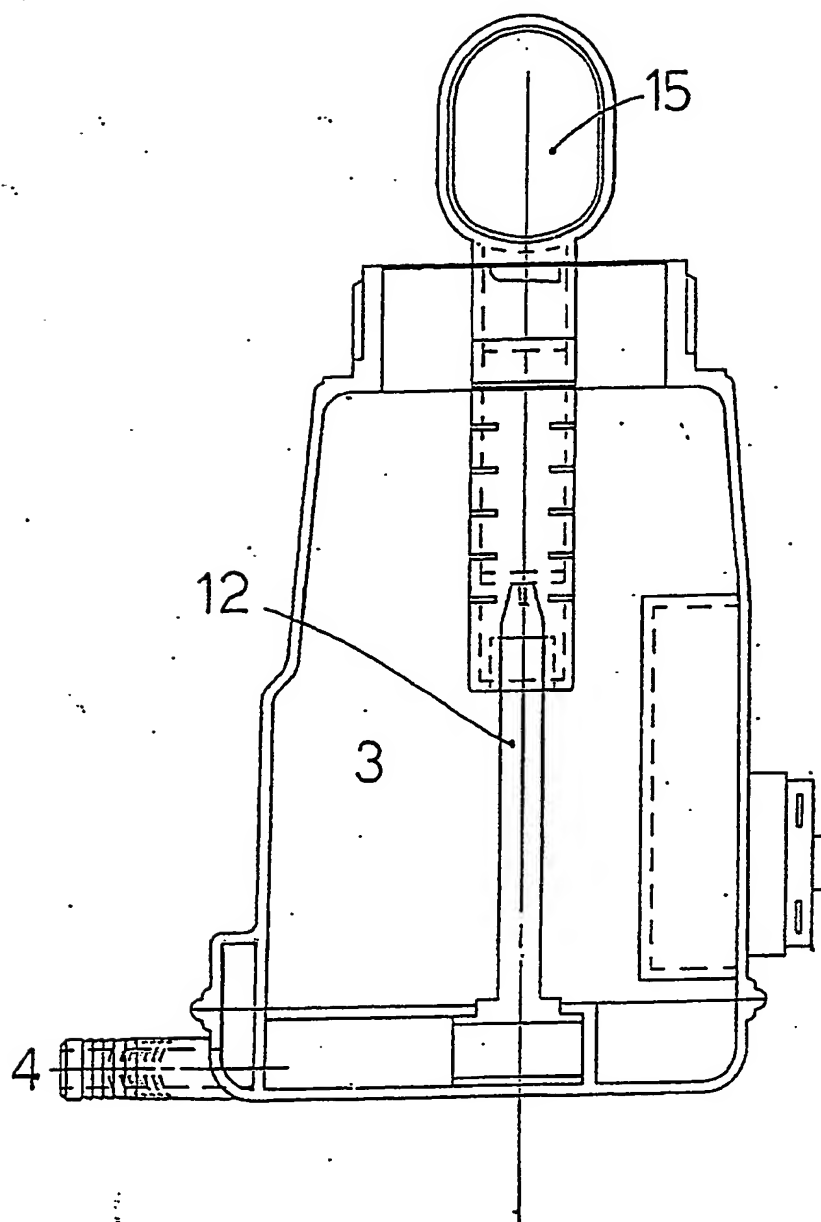


FIG. 3





European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number

EP 90 12 2049

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP-A-0 219 704 (ZANUSSI ELETTRODOMESTICI S.P.A.)  * the whole document *	1, 2, 4, 5, 7	A47L15/42
A	DE-A-2 630 164 (HOLZER) * page 5, line 14 - line 23; figures 2-4 *	3, 5, 7	
A	FR-A-1 420 017 (BOSCH GMBH) * the whole document *	8	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A47L D06F B01J
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 26 FEBRUARY 1991	Examiner J. SCHARTZ
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document  T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document			

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